The Effects of Disaster on Workers: A Study of Burnout in Investigators of Serious Accidents and Fatalities in the U.S. Mining Industry

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Abstract

The Maslach Burnout Inventory (MBI) was administered and scored for 154 Mine Safety and Health Administration (MSHA), U.S. Department of Labor, employees who serve as accident investigators for serious accidents and fatalities as part of their job duties. The subjects responded anonymously during a workshop on stress. The subjects consisted of randomly selected individuals, representative of locations across the country and representative of all mining commodities: coal, metal, nonmetal, stone, and sand and gravel. The Maslach Burnout Inventory assesses three aspects of experienced burnout: emotional exhaustion, depersonalization, and reduced personal accomplishments. The *average* results of the scores for each of the three subscales fell in the moderate range for the study group of MSHA accident investigators. The scores within the moderate range show that the subject population was at the lower end of the range for emotional exhaustion and depersonalization, tending toward a lower burnout risk, while the group evidenced a lower sense of personal accomplishment in their jobs, indicating a higher risk for burnout. It is concluded that overall this group is at moderate risk for burnout, and the authors recommend follow-up with this population.

Introduction

American workers are working harder and longer than they have in the past two decades just to maintain their standard of living. The predicable result is a workforce more at risk for psychological, physical, and behavioral health problems. During recent health care reform discussions in regard to United States workers, the costs associated with work-related chronic ill health were described as representing a massive drain on the economy, with occupational stress cited as a reason for the rapid increase in compensation claims.[1] The Northwestern National Life Insurance Company found that their stress-related disability claims rose from 6% in 1982 to 13% in 1990 [2]. It is of interest to note that disability due to job stress alone, without evidence of any physical injury or illness, is now a compensable condition in about one-half of the states in the U.S.[3] At the recent "Work, Stress, and Health '99 Conference" it was noted that absences due to stress-related illnesses are a growing concern.[4]

The study of occupational stress was given new focus in the 1970s when U.S. Public Law 91-595 established the National Institute for Occupational Safety and Health (NIOSH). The mission of NIOSH is to ensure a safe and healthy workplace for America's workforce. To carry out this mission, the agency conducts research and makes recommendations for the prevention of work-related disease and injury. Recently, NIOSH has identified 21 research priorities including the organization of work that encompasses work-related psycho-social stressors.[5] Thus, occupational stress has the agency's rapt attention.

The issue of stress on the job provided a focus for The American Psychological Association and NIOSH as they joined together in the beginning of 1990 and declared the 90's the "Decade of Stress."[6] Targeted resources have supported work resulting in a growing body of research on stress on the job. There has been limited work in the mining industry regarding critical incident stress in mine disasters and mine rescue.[7, 8] Although the subject population in this study has the potential for exposure to a critical incident, exposure to day to day, cumulative type stress, which can lead to burnout, is more likely. To access aspects of experienced burnout, the Maslach Burnout Inventory (MBI)[9] was administered and scored for a group of randomly selected Mine Safety and Health Administration (MSHA) accident investigators. The MBI has three subscales to assess the different aspects of experienced burnout: emotional exhaustion, depersonalization, and reduced personal accomplishments. This is the first study of the MSHA accident investigators' population with respect to worker burnout.

The Human Stress Response

Stress is a normal human characteristic. Although there is imperfect agreement on the nature of human stress, there are some basic shared concepts. Hans Selye, an Austrian endocrinologist, described a consistent pattern of mind-body reactions in 1926.[10] He referred to this pattern as the rate of "wear and tear" on the body and

coined the term *stress,* which refers to the general response of the body to any demand placed upon it. The demand Selye referred to as the *stressor*. The stressor leads to a *stress response.* The stress response in turn can lead to stress-related disease (Figure 1).

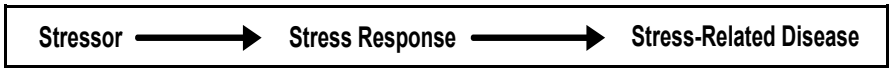

Figure 1. The Stress Response.

A stressor can be either psycho-social or biogenic. Psycho-social stressors are environmental events wherein the individual interpretation plays a key role in the onset of the response. Biogenic stressors involve stimulants such as caffeine, nicotine, and amphetamines. Biogenic stressors initiate the stress response directly, whereas psycho-social stressors initiate the response indirectly. Only those psycho-social stressors interpreted as threatening by the individual will initiate the stress response. For example, Cannon described the fight or flight response, a physical response elicited by *perceived* potentially dangerous situations.[11]

There are two further stress categories: *traumatic stress* and *cumulative stress*. Traumatic stress is faced by workers such as emergency room workers, police officers, firefighters, and military personnel. This type of stress is directly related to a critical incident and sometimes referred to as critical incident stress. Critical incident stress may result in physical and psychological reactions including sleep, eating, social disturbances, nightmares and sometimes flashbacks. A severe reaction to a critical incident may result in Post-traumatic Stress Disorder (PTSD).

As noted in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, the essential feature of PTSD is the development of characteristic symptoms following exposure to an extreme traumatic stressor involving direct personal experience of an event that involves actual or threatened death or serious injury, or other threat to one's physical integrity; or witnessing an event that involves death injury, or a threat to the physical integrity of another person; or learning about unexpected or violent death, serious harm, or threat of death or injury experienced by a family member or other close associate.[12] The person's response to the event must involve intense fear, helplessness, or horror (or in children, the response must involve disorganized or agitated behavior). The characteristic symptoms resulting from the exposure to the extreme trauma include persistent re-experiencing of the traumatic event, persistent avoidance of stimuli associated with the trauma and numbing of the general responsiveness, and persistent symptoms of increased arousal. The full symptom picture must be present for more than one month and the disturbance must cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

The second, more common type of stress is the day-to-day, cumulative type stress. Cumulative stress also has health consequences and may lead to burnout. Pines and

Aronson[13] define burnout as "a state of physical, emotional, and mental exhaustion caused by long-term involvement in emotionally demanding situations."

Clearly, obtaining a measurement of stress specific to work is difficult, in that we know stress in other parts of an individual's life impacts the work life. Thus, many researchers are moving toward lifestyle stress measures. Building on the work of others, Hurrell and Murphy presented a model of job stress and health.[14] To provide a framework for the reader, this model is presented in Figure 2. As the figure shows, job stress is seen as a situation in which the working condition interacts with the individual worker characteristics and results in a disruption, which can lead to a variety of illnesses.

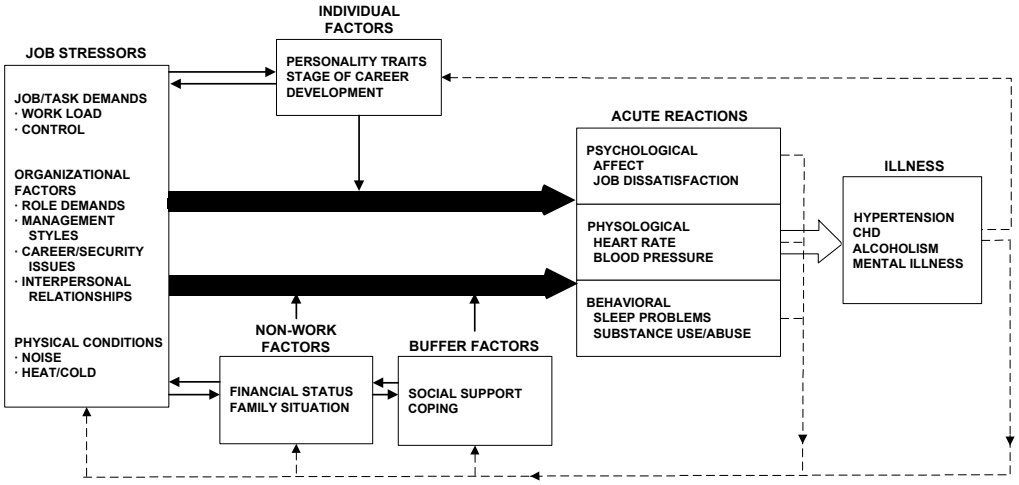

Figure 2. Model of job stress and health. (Hurrell & Murphy, 1998)

Certain jobs are, by their nature, more prone to stress than others. For example, disaster workers may be thought of as normal people exposed to abnormal circumstances. When disaster workers respond to a medical emergency, a natural disaster, a terrorist threat, or an underground mining accident, they are exposed to traumatic situations. Whether they are first responders, people who happen to be on the scene, or highly trained professionals such as rescue teams or emergency personnel, these workers naturally experience normal human responses to their circumstances. As a result, these workers tend to be at higher risk for occupational stress illnesses. It is suggested that certain mine industry workers fall into this category of higher risk because of the hazardous environment in which they must work, and the types of tasks they do daily on the job. The authors specifically suggest that the subject population, mine accident investigators, fall into this higher risk category.

Danger in the Mining Industry

Mining is one of the most dangerous occupations in the world (Figure 3). Historically, mining has been the industry sector with the highest fatal and nonfatal injury rates. Even today, it represents the industry sector with the highest fatal injury rate, more than five times the national average. The mining industry in the United States is highly regulated under Title 30 Code of Federal Regulations, Part 50, Mineral Resources, and a separate government agency, the Mine Safety and Health Administration (MSHA), which is part of the U.S. Department of Labor enforces the laws concerning mining. In addition, the National Institute for Occupational Safety and Health, under the Department of Health and Human Services, includes a Mine Safety and Health Research Division. This mining division is charged with providing for the safety and health of the nation's miners through research. According to the MSHA Part 50 data, in a recent ten-year period (1989-1998), there were 240,499 injuries in the mining industry in the United States. This included 988 fatalities, 161,841 non-fatal injuries with days lost, and 77,670 non-fatal injuries with no days lost.

Figure 3. Mine explosion at the portal.

Role of MSHA Inspectors

MSHA inspectors carry out the day-to-day mine inspections and enforce the mining safety and health regulations passed by Congress. When a serious injury or fatality occurs at a mine site, some of these mine inspectors are given a collateral duty as accident investigators. They become responsible for conducting an investigation into the accident, determining the cause of the accident, and making recommendations of any violations. The majority of mining fatalities are a result of falls of ground. In underground mining, this refers to the fall of the roof onto the victim. In addition, numerous accidents involve the heavy machinery used to extract the mineral from the earth. These accidents are sudden and usually the injuries are traumatic to the body.

Within the last several years, an additional task has been imparted to the investigators, that of meeting with the families of the victims and presenting the official report. Approaching this sometimes emotional, always difficult task of

presenting the report to grieving family members while completing the principal task of fact-finding presents a challenge to the accident investigators and has created, for some, a conflict of roles.

The consequences of burnout due to these stressors are potentially problematic for both the individual and the organization. Burnout can result in work of less quality, job turnover, absenteeism, and low morale. In addition, burnout is correlated with various self-reported indices of personal dysfunction, including physical exhaustion, insomnia, increased use of alcohol and drugs, and marital and family problems.

The Instrument

The Maslach Burnout Inventory is a self-administered measure containing three subscales that assess the different aspects of experienced burnout: emotional exhaustion, depersonalization, and reduced personal accomplishments. It takes subjects 10-15 minutes to complete the inventory. According to Maslach, burnout is a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment.[9] A key aspect of the burnout syndrome is increased feelings of *emotional exhaustion*. As emotional resources are diminished, there is a feeling that the worker can no longer give of him/herself at a psychological level. Another aspect of the burnout syndrome, according to Maslach, is the development of *depersonalization,* which includes negative and cynical attitudes and feelings. A third aspect of the burnout syndrome, *reduced personal accomplishments*, refers to the tendency to evaluate oneself negatively, particularly with regard to one's work with people.

Each of these three aspects is measured on separate subscales. The *Emotional Exhaustion* subscale assesses feelings of being emotionally overextended and exhausted by one's work. The *Depersonalization* subscale measures a negative feeling and personal response toward recipients of one's service. The *Personal Accomplishment* subscale assesses feelings of competence and achievement in one's work. The frequency that the inventory respondent experiences feelings related to each subscale is addressed using a seven-point, fully anchored response format.

Burnout is conceptualized as a continuous variable, ranging from low to moderate to high degrees of experienced feeling. It is not viewed as a dichotomous variable, which is either present or absent. A high degree of burnout is reflected in high scores on the Emotional Exhaustion and Depersonalization subscales and in a low score on the Personal Accomplishment subscale. A moderate degree of burnout is reflected in moderate scores on the three subscales. A low degree of burnout is reflected in low scores on the Emotional Exhaustion and Depersonalization subscales and in a high score on the Personal Accomplishment subscale. The Maslach Burnout Inventory has been found to be reliable, valid, and easy to administer. The subject responds to 22 statements using a seven-point Likert scale ranging from never (0) to everyday (6). There were nine statements scored on the Emotional Exhaustion subscale, five statements were scored on the Depersonalization subscale, and eight

statements were scored on the Personal Accomplishment subscale. Examples of statements are found in Figure 4.

HOW OFTEN:	0	1	2	3	4	5	6
	Never	A few times a year or less	Once a month or less	A few times a month	Once a week	A few times a week	Every day

HOW OFTEN 0-6	Statements:
_____	I feel I'm positively influencing others people's lives through my work.
_____	In my work, I deal with emotional problems very calmly.
_____	I've become more callous toward people since I took this job.

Figure 4. Example of Maslach Burnout inventory statements.

Subjects and Method

The subjects for the present study were 169 MSHA accident investigators from locations across the country and representative of all mining commodities: coal, metal, nonmetal, stone, and sand and gravel. Of the 169 subjects, approximately 167 were male, a demographic reflective of the mining industry. The subjects were participating in a two-week training class that included a 3-1/2 hour workshop entitled, "Stress, Coping and Grief for Accident Investigators" given by one of the researchers. Two separate two-week training sessions were offered, one in the spring and one the following winter. Each training session consisted of four randomly selected groups; thus, there was a total of eight subject groups. Comparisons were made between the spring and winter groups, the eight individual groups were compared to each other, and each group was then compared with the overall average scores on the three subscales. No significant statistical differences were found between the groups.

The Maslach Burnout Inventory was administered to the subjects. The instrument was passed out at the very beginning of class, before introductions, and the students were asked to fill it out voluntarily. They were asked to include their age and years of experience in accident investigation (including experience outside the agency). Fifteen of the accident investigators' responses were excluded from the analysis (four investigators did not complete their surveys; four did not note their experience; two did not note their age; and five did not note their age or experience).

The ages of the investigators (see Figure 5) ranged from 26 to 67 years, with an average age of 48 years and a standard deviation of 6.62. The ages of the investigators by category included 10% under the age of 40; 43% were age 40-49; 44% were age 50-59; and 4% of the investigators were age 60 and over.

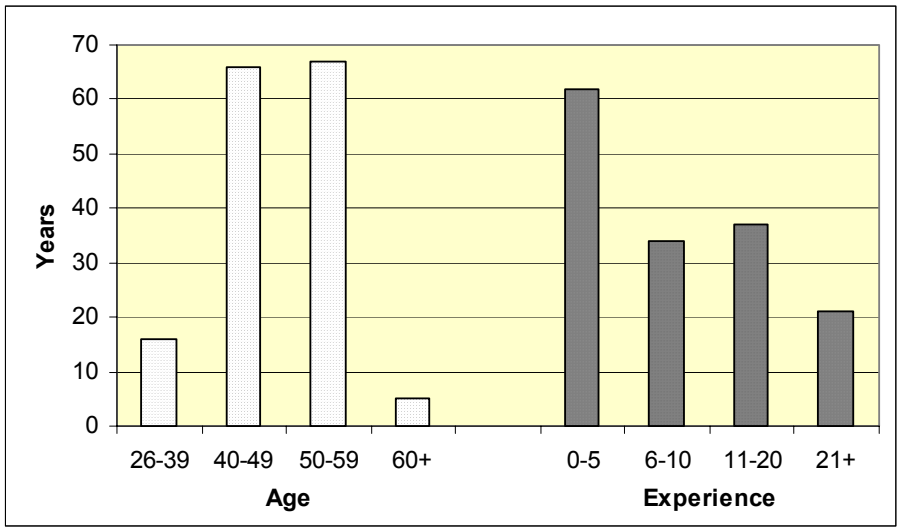

Figure 5. Years of age and experience of MSHA investigators in study.

The group of investigators had 1,558 total years of experience, or an average of 10.1 years with a standard deviation of 8.29. The range was from 0 years (5 investigators) to 1 investigator having a high of 33 years of experience. The median was 8 years experience, and the mode was 1 year of experience (14 investigators). There were 96 investigators (62% of the overall group) with 10 years of experience or less; 24% had 11-20 years of experience; and 14% had 21 years or more of experience.

The data were analyzed by creating XY (scatter) charts with linear trend lines to illustrate the Emotional Exhaustion, Depersonalization, and Personal Accomplishment scores in relation to the age and experience of the investigators. The authors observed that with the exception of a slight increase in Emotional Exhaustion as age increases, all other trends remained nearly level. Further analysis of the relationships of the three aspects of burnout revealed that when Emotional Exhaustion rises, Depersonalization also tends to rise, while Personal Accomplishment tends to fall. These are all indicators of a higher degree of burnout. Maslach states that given our limited knowledge about the relationships among the three aspects of burnout, the scores for each subscale are considered separately and are *not* combined into a single, total score.

Anecdotal Data

Many times when the issues of stress and grief are discussed, they trigger specific situations or memories for individuals. Opportunities to share reactions and experiences were a part of the workshop, and at the end of the class the groups were given an opportunity to share their experiences in writing anonymously. In examining the data from these self-report written anecdotes, two major themes emerged seen that contributed to the accident investigators' stress. One was the

demands placed on the investigator from within the organization, and the other, dealing with the grieving families.

The need for the latest information becomes crucial after a serious accident or fatality in a mine. Unfortunately, continual demands from headquarters for information can slow down, interrupt the process, and give a message of lack of trust to the investigator. One investigator noted:

> "Management is 90% of the stress. They want pictures, a preliminary report, and a video *immediately*. There is inquisition about what you did every minute and what you 'should be doing.' You feel as if they are second guessing you and they don't trust you. If a preliminary report is important to headquarters, then it should be formalized and part of the process. . . . . [I] understand that they need information, but if I keep getting calls, it interrupts my work."

Karasek[15] suggested that the amount of work is not as critical to worker health as the interaction of workload and the amount of control a worker has over the work and related work processes. This is referred to as "decision latitude." Demands placed upon the worker, especially conflicting or unclear tasks, contribute to worker stress. As one worker reported:

> "I was asked by management to go to the deceased miner's home and spend some time with his family. At the time it was not clear to me what I was supposed to do. Things went ok, except it was very hard for me not to get emotionally involved. The victim was a young man in his 20s. I now understand why it was so difficult [relating to information provided in class concerning death at a young age]. It was one of the hardest things I've had to do since I have been with . . . ." [the agency].

The majority of anecdotes dealt with the exchanges with the family of the accident victim. One worker reported:

> "My method of self-preservation is to distance myself from the emotional side of the incident. This may seem cold, but in no way means that I'm uncaring or unfeeling."

The Maslach Inventory evidenced this trait in the moderate depersonalization scores, indicating that emotional distancing is evident in this population.

One of the characteristics of the mining industry is that it is a small, close-knit community. Many people in the industry know each other, are related to each other, or our good friends. Mines are not typically located near large cities but mostly in rural areas near small towns. Thus, when there is an accident, it affects the entire mining community. Although workers are assigned to their investigations in different geographic locations from their day to day work location, many of the subjects had experienced knowing the victim or family.

> "After the recovery of the last body. . . . we [the rescue team] were on our way outside. It was a cold, clear night and you could see the lights outside from inside the mine. I felt very strange inside and worried what I was going to say to the family . . . . I could hear people crying and praying. What I was worried about the most was that the young man killed in the roof fall was my friend who had worked for me some years before. I knew his family and they knew me. I didn't know who he was until we almost had him out of the roof fall."

Another example of this community characteristic:

> "A fatal accident occurred where the owner of a small mine was killed . . . . the second person at the scene was the victim's nineteen year old son, who helped in the rescue attempts."

> "Recently, I investigated a fatality where a driller had been killed by a falling rock. The driller, a woman, was a drilling partner with her husband. He was standing just a few feet from her when she was killed. He told us during the interviews that he knew she was dead, but he just held her for a while before getting help. The interview was the toughest that I have ever experienced."

The two themes contributing to the accident investigator's stress levels and potential burnout–the organizational demands and the task of interfacing with the families–are specific to this population and thus it is inappropriate to generalize the data. One worker, in summing up his experience, wrote:

> "After one investigation I actually sat back and reflected on how accidents can happen to anyone –including myself. I felt I had to get home right then to see my wife and children and spend time with them. I then had fears for several days that my wife or children may be involved in an accident of some sort . . . ."

This is a normal reaction, though certainly stressful, for an individual in such circumstances.

Results and Conclusions

The results of the scores for each of the three subscales of the MBI (Emotional Exhaustion, Depersonalization, and Personal Accomplishment) fell in the Moderate range (Figure 6). This indicates that the accident investigators are experiencing moderate levels of burnout. It is important to remember that low, moderate, and high are all indicators that the respondents are experiencing some level of burnout.

The accident investigators scored in the lower half of the Moderate range for Emotional Exhaustion. These scores indicate that the investigators are feeling a moderate level of being emotionally overextended and exhausted in their work.

The Depersonalization score fell toward the lower end of the Moderate range on the subscale. The score was 1.8 points from the characterization indicating a low level of burnout. The need to depersonalize may be interpreted as a necessary component in accident investigation. In other words, purposefully trying to remove oneself from the personal/human aspect of the job may facilitate successful completion of the job.

The Personal Accomplishment aspect is scored in the opposite direction from Emotional Exhaustion and Depersonalization. The Personal Accomplishment score was in the upper end of the Moderate range, which was 1.1 points from the

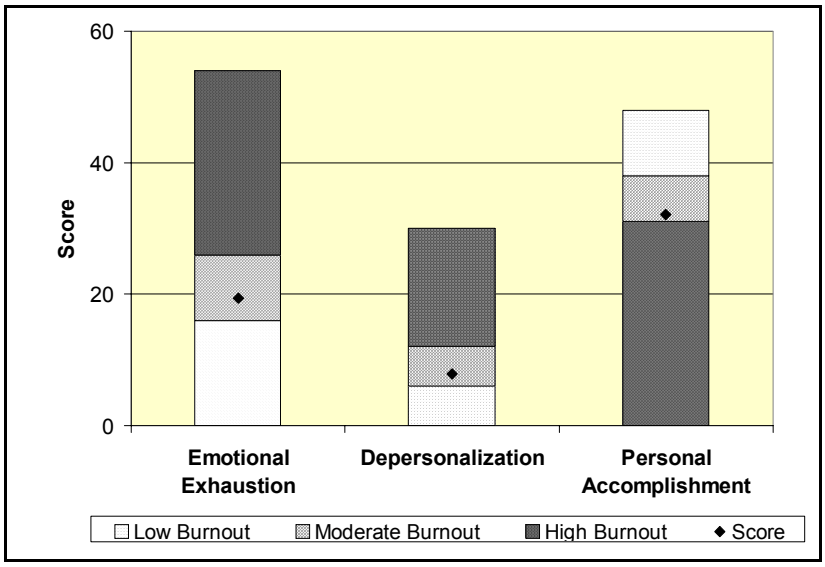

Figure 6. Average scores on each subscale of the Maslach Burnout Inventory. Low, moderate, and high burnout are represented by different shadings on each of the subscales.

characterization, representing a high level of burnout. This indicates that many of the accident investigators do not feel personal satisfaction and a sense of accomplishment in their jobs.

In conclusion, the study group of MSHA accident investigators tended toward emotional exhaustion and depersonalization on the burnout subscales. In addition, they evidenced a moderate tending toward a low sense of personal accomplishment in their jobs. Thus, this is a group at moderate risk for burnout.

Discussion and Recommendations

As this was the first study with this interesting population, follow-up is recommended. Overall, this subject group tended toward burnout. In examining the data from the students' self-report written anecdotes, two major themes contributed to the accident investigators' stress. Dealing with the grieving families, and meeting the other demands placed on the investigator from within the organization. A key finding was that the accident investigators did not evidence a strong sense of personal accomplishment and importance in the job they were doing when investigating the accidents.

Based on the anecdotal data, the authors suggest that specific training in working with grieving families and greater organizational support would be appropriate. In addition, utilizing local community mental health and/or pastoral services are suggested. The data suggest that the organization reevaluate the communication process in the field between headquarters and the investigation site. Generally, the organization provides support in getting the job done, but there is also evidence that

it contributes to slowing down the process and evidence of a lack of support and trust for the investigator in the field.

References

[1] Worker Stress, Health Reaching Critical Point, by Patrick A. McGuire Monitor staff writer, APA Monitor, volume 30 number 5; May 1999.

[2] Northwestern National Life Insurance Company (1991). Employee burnout America's newest epidemic. Minneapolis, MN: Northwestern National Life Insurance.

[3] Elisburg, D. (1995). Workers' compensation issues for psychologists: the workers point of view. In Murphy LR Hurrell JJ, Sauter S., Kieta G. eds Job stress interventions.

[4] Work, Stress, and Health '99 Conference, March 11-13, 1999; Baltimore MD. Sponsored by the American Psychological Association and the National Institute for Occupational Safety and Health.

[5] Rosenstock, L. Work organization at the National Institute for Occupational Safety and Health. J Occup Health Psychol 1997; 2: 7-10.

[6] Stress in the Nineties Conference, sponsored by the American Psychological Association and The National Institute for Occupational Safety and Health, The Hyatt Capitol Hill, Washington D.C.; 1991.

[7] Kowalski, K. M. (1995). A Human component to consider in your emergency management plan: the critical incident stress factor, Safety Science 20, 115-123.

[8] Kowalski, Kathleen M. (1994). A Human Response to Mine Emergencies: The Critical Incident Stress Factor; paper prepared for the 84th annual Mine Inspectors Institute of America, June 12-15, Lexington, KY.

[9] Maslach, Christina (1993). *Maslach Burnout Inventory,* Second Edition. California: Consulting Psychologists Press, Inc.

[10] Selye, H. 1993. History of the Stress Concept. In L. Goldberger and S. Breznitz (Eds.) Handbook of Stress Theoretical and Clinical Aspects. The Free Press, Macmillian, pp. 7-20.

[11] Cannon W.B. Bodily changes in pain, hunger, fear, and rage. Boston: CT Branford, 1929.

[12] Diagnostic and Statistical Manual of Mental Disorders (1994) Fourth Edition, American Psychiatric Association, Washington, D.C.

[13] Pines, A. M. & Aronson, E. (1988) Career burnout: Causes and cures (2nd ed.) New York: Free Press.

[14] Hurrell, JJ. & Murphy, LR. (1998) Psychological Job Stress, chapter in Environmental and Occupational Medicine, Third Edition, edited by William N. Rom. Lippincott-Raven Publishers Philadelphia.

[15] Karasek, RA (1979). Job Demands, Decisions Latitude and Mental Strain: Implications for Job Redesign Admin Sci Q, 24, 285-307.

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